REMARKS

Claims 10-29 are pending in this application. By this Amendment, claims 10, 12, 22, and 24 have been amended, and claims 28 and 29 have been newly added.

As an initial matter, Applicants wish to express sincere appreciation to the Examiner for the courtesy extended to Applicants' representative during the personal interview held on November 12, 2004. At the interview, various rejections outstanding in the May 19, 2004 Office Action were discussed. The following remarks reflect the subject matter discussed during the interview.

REJECTION UNDER 35 U.S.C. § 112, SECOND PARAGRAPH

In the Office Action, claims 10-27 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. In particular, the Office Action asserted that the term "smooth" recited in each of claims 10, 12, 22, and 24 is "a relative term that renders the metes and bounds of the claims unclear." In response, Applicants have amended each of claims 10, 12, 22, and 24 to change the term "smooth bottom" to read --substantially flat bottom--. Thus, reconsideration and withdrawal of this rejection is respectfully requested.

REJECTION UNDER 35 U.S.C. § 103(a)

Claims 10-27 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Robb (U.S. Pat. No. 4,529,860) in view of alleged admitted prior art ("AAPA"). In view of the reasons explained below, Applicants respectfully request reconsideration and withdrawal of this rejection.

Independent claim 10 recites a method of etching an organic film, comprising, among other things, "pressurizing the process chamber to a pressure equal to or higher

than 500 mTorr," "etching the organic film so as to form a ditch having a substantially flat bottom surface while substantially preventing a micro trench," "stopping the etching before the ditch goes through the organic film," and "ending the etching process." Similarly, independent claim 12 recites a method of etching an organic film, comprising, among other things, "pressurizing the process chamber to a pressure between 500 - 800 mTorr," "etching the organic film so as to form a ditch having a substantially flat bottom surface while substantially preventing a micro trench," "stopping the etching before the ditch goes through the organic film," and "ending the etching process."

In the rejection statement, the Office Action admitted that "Robb does not explicitly recite that the etch is stopped before the etching goes through the organic film." Nevertheless, the Office Action asserted that "it would have been obvious ... to stop the etch before the etching goes through the film in the method of Robb because Robb teaches to etch a predetermined amount and admitted prior art teaches it is useful to etch part-way through the layer." Applicants respectfully submit that the Office Action fails to establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a).

The Examiner has the initial burden of presenting a *prima facie* case of unpatentability. To establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a), three basic criteria must be met. First, the prior art references when combined must teach or suggest all the claim elements. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Finally, there must be a reasonable expectation of success. See M.P.E.P. § 2143. Furthermore, case law in this context indicates that the teaching or

suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and that the evidence of a teaching, suggestion, or motivation to combine must be "clear and particular." As discussed below, the Office Action's asserted combination of Robb and AAPA fails to establish a *prima facie* case of unpatentability under 35 U.S.C. § 103(a).

Regarding the first criterion, the Office Action's proposed combination would not teach all the claim elements of claims 10 and 12. For example, there is no teaching or suggestion in either Robb or AAPA of "pressurizing the process chamber to a pressure equal to or higher than 500 mTorr" or "between 500 - 800 mTorr," as recited in claims 10 and 12, respectively. Instead, the method of Robb teaches a pressure ranging from about 13.3 Pa (=97.8 mTorr) to about 53 Pa (=398.8 mTorr).

In response to Applicants' remarks filed on March 29, 2004, the Office Action continues to assert that

> Robb ... teaches that a range of up to 500 mTorr (66.5 Pa, col. 1, lines 26-28) is known. Robb also teaches that high pressure etching of polyimide is also known (col. 1, lines 21-22). The relationship between pressure and etch rate is shown in Figure 5. Robb therefore teaches that the pressure is a result effective variable. [See Page 4 of the Office Action.]

Applicants respectfully disagree with the Office Action's assertion. For example, the only stated reason for parametrically varying the pressure in Robb from 13 Pa (=97.8 mTorr) to 66.5 Pa (498.8 mTorr) is to measure the etch rate and anisotropy of undercutting. See, e.g., col. 4, lines 26-29. Robb then concludes that at pressures greater than about 53 Pa, a significant mask undercutting is observed and, therefore, the pressure should be maintained below 53 Pa (where anisotropic processes dominate) for an anisotropic etching. See, e.g., col. 5, lines 2-31. Thus, Robb

expressly teaches away from pressurizing above 53 Pa (i.e., 398.8 mTorr). Consequently, one of ordinary skill in the art would not consider that Robb teaches a pressure above 53 Pa (i.e., 398.8 mTorr). Therefore, even if the teachings of Robb and AAPA were somehow combined, the resulting combination would not teach or suggest, among other things, "pressurizing the process chamber to a pressure equal to or higher than 500 mTorr" or "between 500 - 800 mTorr," as recited in claims 10 and 12, respectively.

Furthermore, while admitting that Robb teaches a pressure range only up to 500 mTorr, the Office Action continues to assert that, since Robb teaches a result-effective variable (i.e., pressure), "it would have been obvious ... to etch at 500 mTorr or higher in the modified method of Robb because the pressure appears to reflect a result-effective variable which can be optimized." Applicant again disagrees with this allegation. The fact that varying pressure varies the etch rate does not automatically qualify the variable as a result-effective variable. Presumably, any given variable, as a matter of laws of nature, affects in one way or another some results. For example, a pressure always affects temperature. At any given condition, a change in pressure almost always changes temperature, yet it is incorrect and illogical to assume that a pressure is always a result-effective variable. With respect to defining a result-effective variable, M.P.E.P. § 2144.05 II.B provides the following specific guidelines:

> "[a] particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." (Emphasis supplied by Applicants).

That is, in order for a variable disclosed in a prior art reference to be considered as a result-effective variable (which can arguably be optimized to meet the claimed range), the result Applicants obtain with the claimed variable range must necessarily be recognized from the disclosure in the prior art reference, so that the optimum or workable ranges of the variable can be obtained via routine experimentation. If, on the other hand, the result Applicants obtain with the claimed range of the variable are different from, or not recognized by using the disclosure of the prior art reference, the teachings of the prior art reference cannot possibly obtain the same optimum or workable ranges of the variable through routine experimentation, because the prior art teaching would most likely arrive at a result distinctly different from that of the Applicant's claimed invention.

In this case, Applicants are attempting to obtain a ditch (e.g., a contact hole) having a substantially flat bottom without a micro trench. To do so, Applicants, among other things, pressurize the process chamber to the claimed range (i.e., ≥ 500 mTorr or 500 ~ 800 mTorr) as the optimum pressure range for obtaining the substantially flat bottom without a micro trench. Therefore, in order for the pressure in Robb to be considered as a result-effective variable and thereby be optimized to meet the claimed pressure ranges, Robb must have necessarily attempted to obtain the same result as that of Applicants' or at least recognized the result which Applicants' are attempting to achieve. Robb, however, neither attempts to obtain the same result as that of Applicants nor recognizes the result obtained. Instead, Robb merely varies the pressure parametrically to measure etch rate and anisotropy of mask undercutting at different pressures. Not surprisingly, Robb then determines that the optimal pressure

range is between 13 Pa (=97.8 mTorr) and 53 Pa (=398.8 mTorr), i.e., different from the Applicants' claimed range.

Therefore, the pressure variable in Robb cannot qualify as a result-effective variable and, therefore, one of ordinary skill in the art would not have arrived at Applicants' claimed pressure range by conducting routine experimentation based on the disclosure of Robb. Consequently, Robb does not teach "pressurizing the process chamber to a pressure equal to or higher than 500 mTorr" or "between 500 - 800 mTorr," as recited in claims 10 and 12, respectively.

For at least these reasons, the first criterion for a *prima facie* case of obviousness has not been met.

As to the second criterion, there is no suggestion or motivation in either Robb or AAPA to combine or modify the asserted teachings of the references in the manner proposed by the Office Action. The Office Action merely asserts that, since AAPA discloses that "it is useful to stop the etch before the etch goes through the film," it would have been obvious to stop the etch before etching goes through the film in Robb "because Robb teaches to etch a predetermined amount and admitted prior art teaches it is useful to etch part-way through the layer." However, the Office Action's asserted motivation is merely a conclusory statement and does not provide sufficient reasoning as to why asserted "etching part-way through the layer" would have been desired by one of ordinary skill in the art considering Robb's teaching. As is apparent, the Examiner's asserted motivation is a result of impermissible hindsight gleaned from the present application. When the teachings of Robb and AAPA are viewed without such hindsight, one of ordinary skill in the art considering Robb's method would not have

been motivated to stop the etch before the etch goes through the film in the manner proposed by the Office Action since there is no "clear and particular" reason to do so.

Furthermore, despite the explicit teaching of Robb that the pressure in the processing chamber should be maintained below 53 Pa (=398.8 mTorr), the Office Action appears to assert that, since it "discloses" about 498.9 mTorr, the pressure in Robb can be above 498.9 mTorr. This assertion is clearly erroneous because the asserted modification would be completely contrary to the teachings of Robb.

For at least these reasons, Applicants respectfully submit that at least the second criterion for a *prima facie* case of obviousness has not been met.

As to the third criterion, the Office Action is completely silent as to any allegation of reasonable expectation of success in combining the alleged teachings of Robb and AAPA. Applicants respectfully submit that the alleged combination of Robb and AAPA does not show a reasonable expectation of success because it is unclear as to how the complex method steps of Robb could be modified to implement the teachings of AAPA. For at least this reason, Applicants respectfully submit that the third criterion for a *facie* case of obviousness also has not been met.

For at least the reasons set forth above, Applicants respectfully submit that a *prima facie* case of obviousness under 35 U.S.C. § 103(a) has not been properly established. Therefore, reconsideration and withdrawal of this rejection under 35 U.S.C. § 103(a) is respectfully requested.

For the reasons set forth above, Applicants respectfully request reconsideration of this application, withdrawal of the rejections under 35 U.S.C. §§ 112, second paragraph, and 103(a), and timely allowance of all pending claims.

The Office Action contains a number of statements and characterizations regarding the claims and the related art. Applicants decline to subscribe to any statement or characterization in the final Office Action, regardless of whether it is addressed above.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: November 18, 2004

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